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On the Apparent Absence of Wolf-Rayet+Neutron Star Systems: The Curious Case of WR124

Toalá J., Oskinova L., Hamann W., Ignace R., Sander A., Shenar T., Todt H., Chu Y., Guerrero M., Hainich R., Torrejón J.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2018. The American Astronomical Society. All rights reserved.. Among the different types of massive stars in advanced evolutionary stages is the enigmatic WN8h type. There are only a few Wolf-Rayet (WR) stars with this spectral type in our Galaxy. It has long been suggested that WN8h-type stars are the products of binary evolution that may harbor neutron stars (NS). One of the most intriguing WN8h stars is the runaway WR 124 surrounded by its magnificent nebula M1-67. We test the presence of an accreting NS companion in WR 124 using ~100 ks long observations by the Chandra X-ray observatory. The hard X-ray emission from WR 124 with a luminosity of L X ~ 1031 erg s-1 is marginally detected. We use the non-local thermodynamic equilibrium stellar atmosphere code PoWR to estimate the WR wind opacity to the X-rays. The wind of a WN8-type star is effectively opaque for X-rays, hence the low X-ray luminosity of WR 124 does not rule out the presence of an embedded compact object. We suggest that, in general, high-opacity WR winds could prevent X-ray detections of embedded NS, and be an explanation for the apparent lack of WR+NS systems.

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Keywords

circumstellar matter, ISM: jets and outflows, stars: evolution, stars: massive, stars: neutron, stars: Wolf-Rayet

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